Claim Rejections - 35 U.S.C. §112, second paragraph

Claims 17-20 were rejected as being indefinite for reciting a use without any active, positive steps. Claim 17 was further rejected as being dependent upon claims which do not recite compositions. Claims 17-20 are amended as indicated herein. Applicants respectfully urge that the rejections are moot in light of such claim amendments.

Claim Rejections - 35 U.S.C.§101

Claims 17-20 were rejected as being improper process claims. Applicants urge that such rejection is moot in light of the amendment of claims 17-20 as indicated herein.

Claim Rejections - 35 U.S.C. §102

Claims 17-20 were rejected under 35 U.S.C.§102(b) as being anticipated by Dams et al. (WO 92/17635) or Haniff et al. (U.S. Patent No. 5,663,273).

It is alleged that Dams et al. exemplifies the oil and water repellency (before and after laundering and dry cleaning) of polyester/cotton blend fabric after treatment, with a polyurethane derived from acetone oxime, polymethylpoly phenylisocyanate, N-methylperfluorooctanesulfonamido ethanol, isocyanatoethylmethacrylate and 2-mercaptoethanol. It is also alleged that Haniff et al. discloses 1) the preparation of polyurethanes derived from 2,2,4-trimethyl-1,6-diisocyanatohexane and perfluorinated diols; 2) a process of treating class microscope slides with isopropyl acetate solutions of said polyurethanes, wherein the coatings obtained are both water and oil repellent; 3) the preparation of a monofunctional hydroxyl perfluoropolyether possessing a crosslinkable function for use as a component in the polyurethanes; 4) a wide variety of polyisocyanates as useful monomers; and 5) a preferred molecular weight of said polyurethanes from 3000 to 30,000.

Applicants respectfully disagree. Applicants respectfully submit that any such disclosure by the cited references cannot be considered to teach or suggest the present invention. Applicants point out that the present invention is directed to methods to form on surfaces of objects films having hydro and oil repellant properties by applying to said surfaces aqueous dispersions of fluorinated oligourethanes having number average molecular weight lower than or equal to 9.000, determined by vapour pressure osmometry, the oligourethanes having a branched structure, optionally crosslinked, formed of certain monomers and macromers, as claimed. The structure of the oligourethanes comprise polyisocyanates having NCO functionality higher than 2 (component a), bifunctional hydrogenated monomers (component b) and one or more of bifunctional (component c) and monofunctional (component e) hydroxyl (per)fluoropolyethers.

Applicants emphasize that for the oil and water repellent properties of the present invention the polyisocyanate (component a) has a NCO functionality, determined by titration with dibutylamine-HCl (ASTM D2527), higher than 2. In Example 11 of the specification, it is demonstrated that films obtained with aqueous dispersions containing the ionomeric branched polyurethanes of the invention, prepared according to Example 9 bis (See page 34), demonstrate both water and oil repellent properties. In Example 11 it is also demonstrated that linear ionomeric polyurethanes, prepared according to Example 9 (comparative) (See page 32), are not so effective as oil and water repellent agents as are the compounds included in the present invention (See bottom rows of Table 1). Moreover, it can be seen from Table 2 that after dipping the created sample in water at 23°C for 30 minutes, the oil and water repellency was retained in the sample treated with the dispersion according to the present invention (See Example 9 bis), but lost in the sample treated with

the dispersion of the linear polyurethane (See Example 9 (comparative)). Applicants urge that such results are quite unexpected in light of the prior art including the Dams et al. and Haniff et al. references.

Indeed, Applicants respectfully submit that the methods of the present invention including such aqueous dispersions of fluorinated oligourethanes are not taught or suggested by the cited references. Applicants point out in particular that the Dams et al. reference discloses a fluorochemical composition comprising one or more fluorinated compounds, each comprising the following components: (i) a fluorochemical oligomeric portion comprising an aliphatic backbone with a plurality of fluoroaliphatic groups attached thereto, each independently linked to a carbon atom of the aliphatic backbone; (ii) an organic moiety different from the fluorochemical oligomeric portion; (iii) a non-polymeric isocyanate-derived linking group which links the fluorochemical oligomeric portion to the organic moiety; and (iv) a group bonded thereto, which can impart soft hand, stain release, water repellency.

For purposes of clarity, Applicants review the synthetic scheme for obtaining the fluorinated compounds of the dispersions according to Dams et al. Step 1: the fluorochemical monomer containing (See formula V at top of page 24) pendant R_f group (i.e., fluoro aliphatic groups) and an ethylenic unsaturation, is oligomerized in the presence of a free radical initiator and an end capping agent. Optionally, oligomerization may occur with a nonfluorinated monomer having an olefinic unsaturation. Step 2: the oligomer obtained in step 1 is reacted with a mono or polyisocyanate. Step 3: the polyurethane formed in step 2 is reacted with an isocyanate blocking agent. Furthermore, for that it concerns the final compositions comprising the compounds of Dams et al., it is stated at page 40 (lines 13-14) that the dispersions comprising the fluorochemical composition also contain an amount of emulsifier effective to stabilize the dispersion. As the dispersion of

Example 26 at page 69 (Table VII) of Dams et al. is addressed in the Office Action, Applicants remark in particular that such dispersion was obtained by reacting in the presence of an emulsifier the following compounds: the intermediate I6, a functionalized fluorochemical oligomer containing a urethane linking group by radically polymerizing N-methylperfluoroctanesulfon amido ethanol with isocyanatoethylmethacrylate by using 2-mercaptoethanol as end-capping agent; polymethylenepolyphenylisocyanate (PAPI), having an NCO functionality higher than 2; and acetone oxime (See page 56, lines 36-37 in combination with Table V (line 31) at page 58).

Applicants therefore respectfully submit that Dams et al. cannot be considered to teach or suggest the present invention, in light of the numerous differences between this reference and the present invention. Applicants first wish to point out that the fluorinated oligomer or copolymer containing pendant fluoroaliphatic groups of the cited reference is absent from the oligourethanes of the present invention, which can be seen as not containing any of the unsaturated fluoroaliphatic monomers according to Dams et al. It is also noted that in Step 2, Dams et al. discloses the use of monoisocyanates, diisocyanates and polyisocyanates. However, Applicants point out that in using a monoisocyanate in the case of the present invention it is not possible to synthesize a polyurethane. Moreover, in using a diisocyanate in the process of the present invention, only an oligourethane compound with inferior water and oil repellent properties can be obtained, as compared to the oligourethanes and enhanced properties according to the present invention (See Example 11). That is, in Dams et al. there is absolutely no disclosure regarding the use of polyisocyanates as in the present invention as compared to the diisocyanates or monoisocyanates. Also important, Applicants wish to point out that in the synthesis of the disclosed fluorinated compounds, the cited reference Dams et al. does not teach or suggest the bifunctional hydrogenated monomers (component b) according to

the present invention. Although in Example 26 Dams et al. discloses the composition N-methylperfluoroctanesulfonamido ethanol, such disclosure has absolutely nothing to do with the polyurethane of the invention, in that there is no disclosure of the perfluoropolyether and component b) as claimed. Moreover, it is to be noted that the aqueous dispersions of Dams et al. require surfactants as stabilizers. In contrast, the dispersions of the present invention are stable and therefore do not require a surfactant (pages 12-14 of the specification). In sum, Dams et al. simply does not teach or suggest the present invention.

Applicants further submit that Haniff et al. cannot be considered to teach or suggest the present invention. Applicants note several examples as setting forth the disclosure of the Haniff et al. reference. In Example 17, for instance, there can be found a description regarding the synthesis of a polyurethane obtained by reacting a (fluorinated) diol with 2,2,4-trimethyl-1,6 diisocyanato hexane of formula:

$$OCN\text{-}CH_2\text{-}C(CH_3)_2\text{-}CH_2\text{-}CH(CH_3)\text{-}(CH_2)_2\text{-}NCO$$

In a subsequent and final step, dimer acid diisocyanate (DDI) and N-methyl diethanolamine are added and reacted with the product formed in the initial step. In Examples 18 and 19, Haniff et al. states that as diols in the procedure of Example 17 were used the R_f diols according to Examples 14 and 15, that is:

- Example 14: the synthesis of di-(2-hydroxy-4-oxa-6, 7-one-7-perfluoroalkyl) thioether having the formula: $(R_f\text{-}CH{=}CH\text{-}CH_2\text{-}O\text{-}CH_2CH(OH)\text{-}CH_2)_2$ S.
- Example 15: the synthesis of di-(2-hydroxy-4-oxa-6,7-ene-7-perfluoroalkyl) butylamine having the formula: $(R_f\text{-}CH{=}CH\text{-}CH_2\text{-}O\text{-}CH_2\text{-}CH(OH)\text{-}CH_2)_2\text{-}N\text{-}(CH_2)_3\text{-}CH_3$.

Applicants further note that Example 2 discloses the preparation of the monofunctional hydroxyl perfluoropolyether possessing a crosslinkable function, having the formula $(R_f\text{-}CH_2\text{=}CH\text{-}CH_2)O\text{-}CH_2\text{-}CH(CH_2OR)_2\text{-}CH_2OH$, wherein R_f is a C_8 perfluoroalkyl and R is $CH_2CH\text{=}CH_2R_f$.

However, Applicants respectfully submit that no teaching or suggestion of the present invention can be found in the Haniff et al. reference. Applicants respectfully urge that the polyisocyanates of Haniff et al. are diisocyanates which are unsuitable for obtaining the oligourethanes of the present invention. Applicants have demonstrated, as discussed above, that such diisocyanates are not suitable for obtaining the polyurethanes with improved water and oil repellent properties according to the claimed invention. Applicants also emphasize that the present invention discloses perfluoropolyether-based polyurethanes having improved effectiveness as to oil and water repellent properties, as compared to the known PFPE-based polyurethanes. Yet, the R_f-diols of the examples of Haniff et al. (See Examples 18 and 19) have absolutely nothing to do with the perfluororpolyether diols used in the synthesis of the polyurethanes of the present invention. Such perfluoropolyether diols in fact do not contain double bonds or amine or thioether functions. Regarding Example 2, Applicants point out that it should be quite clear from the disclosed formula for the monofunctional fluorinated diol that such compound is no teaching or suggestion of the monofunctional hydroxyl (per) fluoropolyether (component e) as may be included in the oligourethanes of the present invention, which do not contain C_8 perfluoroallkyl groups or ethylenic unsaturations. In sum, Applicants respectfully submit that the Haniff et al. reference also fails to teach or suggest the present invention.

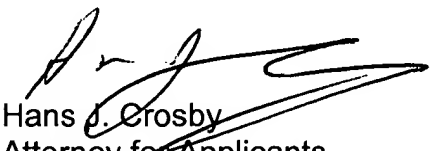
In view of the amendments and remarks above, Applicants respectfully submit that this application is in condition for allowance and request early notification in that regard.

If for any reason, the Examiner feels the application is not now in condition for allowance, it is respectfully requested that the Examiner contact, by telephone, the Applicants' undersigned attorney at the indicated telephone number to arrange for an interview to expedite the disposition of this application.

In the event this paper is not considered to be timely filed, Applicants hereby petition for an appropriate extension of time. The fee for this extension may be charged to our Deposit Account No. 01-2300, along with any other fees which may be required with respect to this application.

Respectfully submitted,

ARENT FOX KINTNER PLOTKIN & KAHN, PLLC



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Enclosures: Marked-Up Copy of Claims
Petition for Extension of Time
Information Disclosure Statement

MARKED-UP COPY OF CLAIMS

Claim 17 (Amended). [Use of the oligourethanes and of their compositions according to claim 1 to form oil- hydro-repellent films.] A method to form on surfaces of objects films having hydro and oil repellant properties comprising applying to said surfaces aqueous dispersions of fluorinated oligourethanes having number average molecular weight lower than or equal to 9.000, determined by vapour pressure osmometry, said oligourethanes having a branched structure, optionally crosslinked, formed of the following monomers and macromers:

a) aliphatic, cycloaliphatic or aromatic polyisocyantates, having NCO functionality, determined by tritration with dibutylamine-HCl (ASTM D2572), higher than 2;

b) bifunctional hydrogenated monomers wherein the two functions are chemically different, having general formula:

$$X_0 - (CR_1^A R_2^A)_b - Y_0 \qquad \text{(Ib)}$$

wherein:

R_1^A and R_2^A, equal to or different from each other, are H, aliphatic radicals from 1 to 10 carbon atoms,

b is an integer in the range 1-20,

$X_0 = X_A H$ with X_A = O, S,

Y_0 is anionic or cationic salifiable function, or, when in the formula (Ib) X_0 = OH, b = 1, $R_1^A = R_2^A$ = H, Y_0 is an hydrophilic group having formula

$-CH_2O-(CH_2-CH_2O)_{nT}-CH_3$ (Ib1)

wherein nT is an integer in the range 3-20;

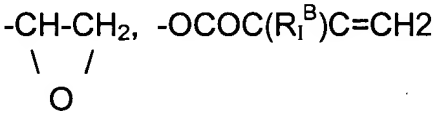
and one or more of the following compounds:

c) bifunctional hydroxyl (per)fluoropolyethers having a number average molecular weight in the range 400-3,000;

e) monofunctional hydroxyl (per)fluoropolyethers (e^0) or monofunctional hydroxyl (per)fluoroalkanes (e'), said compounds (e^0) and (e') having a number average molecular weight in the range 300-1,000,

and optionally the following compounds:

d) hydrogenated monomers capable to insert a crosslinkable chemical function in the oligourethane, having the formula (Ib), wherein R_1^A, R_2^A, b and X_0 are as above derined and Y_0 is selected from the following functional groups:



$-Si(OR_x)_3$, $-CH_2CH=CH_2$, $-OCH=CH_2$

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wherein

R_I^B = H, CH_3;

R_x is a saturated C_1-C_5;

d') hydrogenated-active compounds, capable to form bonds with the NCO functions stable at the hydrolysis by lable to heat.

Claim 18 (Amended). The method [Use] according to claim 17, wherein films are obtained by crosslinking with polyisocyanates oligourethanes comprising the component c).

Claim 19 (Amended). The method [Use] according to claim 17, wherein films are obtained by thermally or photochemically crosslinking oligourethane comprising the optional component d).

Claim 20 (Amended). The method [Use] according to claim 17, wherein films are obtained by thermally crosslinking oligourethane comprising components c) and d^{I}).